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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,632	09/18/2001	Kunal R. Parekh	MI22-1816	3955

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EXAMINER
HUYNH, YENNHU B

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 07/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/955,632	PAREKH ET AL.	
	Examiner	Art Unit	
	Yennhu B Huynh	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for R ply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25 and 44-59* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25 and 44-59* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to the Amendment filed on 3/6/03.

Claims 26-43 have been canceled by Preliminary Amendment filed on 9/18/02.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 & 2 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In claim 1 the term "only two" is not enabled by the specification. Correction is required.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Method Of Forming Capactitors.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 50-59 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 44-51 of U.S. Patent No. 6,207,523. Although the conflicting claims are not identical, they are not patentably distinct from each other because the different between the two recited limitations is described as of " a doped region formed on a semiconductor substrate" and "a node location defined by a doped region of the semiconductor substrate". It would have been obvious to replace the term of a doped region by a node location, which having the same function as of the doped region. In the case if the node location needed not be formed in the structure, the doped region can serve as an electrically contact point.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1,2,4,5 are rejected under 35 U.S.C. 102(b,e) as being anticipated by Figura et al. (U.S. 5,963,804).

Figura et al. at figs. 1-6 in col. 1-18 disclose a method of making a doped silicon structure, which include:

-Re. Claims1,2, 5: forming a solid mass of silicon material within an opening 18 formed over a doped region 12a of a silicon substrate 12, the mass comprising only two forms of silicon, a undoped silicon layer 20 in physical contact with doped silicon (col.6, lines 41-43) ; forming rugged polysilicon 20b from one of the forms of silicon or from the exposed undoped silicon 20b, and not from another of the form of silicon (col.6, lines 9-46), and forming a cell plate proximate the rugged polysilicon (fig.7, col. 11, lines 1-7); wherein the undoped silicon 20 in contact with the doped diffusion region 11 through plug 12 (fig. 2)

-Re. claim 4: wherein the doped silicon comprises a dopant concentration of at least $5x10^{19}$ atoms/cm3 and the undoped silicon comprises a dopant concentration of at least $5x10^{19}$ atoms/cm3 (col. 6, lines 18-23).

Claims 11,12, 24, 25 & 46-49 are rejected under 35 U.S.C. 102(e) as being anticipated by Jost et al. (U.S. 5,686,747).

Jost et al. disclose a semiconductor memory device, which include:

-Re. claims 11, 12, 24,25 & 46-49: forming an insulative layer 28 over a doped region 22,24 or 26 of semiconductor substrate 11 (fig. 1), an opening 32 or 34 through the insulative layer to the doped region (fig.2), forming two forms of silicon within and filling the opening, the two forms of silicon includeing undoped polysilicon in contact with dope silicon layer 36 (col.4, lines 30-46), exposing the two forms to heating inherent in wafer to form rugged polysilicon from one of the exposed two forms and not from another of the exposed two forms of silicon (col.4, lines 46-49), and forming a cell plate proximate the rugged polysilicon (fig. 6 and col.14-29).

Claims 50-57 are rejected under 35 U.S.C. 102(e) as being anticipated by Wu et al. (U.S. 5,913,129)

Wu et al. disclose a method of fabricating a capacitor structure, which include:

Re. claims 50-57: an insulative layer 26 over a doped region 24 formed on a semiconductor substrate 20,32; an opening 46 through the insulative layer to the doped region; filling the opening with amorphous silicon 47 / polysilicon 48, wherein the doped silicon inside of undoped silicon, that comprising doped and undoped to define a capacitor storage node and exposing a sidewall surface of the storage node , forming

HSG 47 from the undoped silicon of the exposed sidewall surface, and forming a cell plate 52 proximate the storage node (fig. 5C, col.4 & 5, lines 26-39).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Figura et al. (U.S. 5,963,804).

Figura et al. disclose substantially all of the claimed invention, except the dopant concentration of the doped silicon of $5x10^{18}$ atoms/cm3 and undoped silicon of less than $5x10^{18}$ atoms/cm3.

The dopant concentration is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller 105 USPQ233, 255 (CCPA 1955), the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to expected that a change in temperature, or in range, concentration, cycles, thickness, would be an unpatentable modification. Under some circumstance, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA

1945); In re Norman 66 USPQ 308 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Figura et al. (U.S. 5,963,804) in view of Brown (U.S. 5,418,180).

Figura et al. disclose substantially all of the claimed invention. However, Figura et al. do not disclose the mass of silicon comprising forming a layer of doped silicon between two layers of undoped silicon (cl.6).

-Re. claim 6: Brown discloses wherein a mass of silicon comprising forming a layer of doped silicon between two layers of undoped silicon (fig. 3, col. 4, lines 3-33).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Figura et al. invention by incorporating a mass of silicon comprising forming a layer of doped silicon between two layers of undoped silicon to increasing storage node size and density memory device.

Figura et al. also do not disclose conductively doping the undoped silicon after forming the rugged polysilicon (cl. 7), and out diffusing impurity from the doped silicon into the undoped silicon (col.8).

-Re. claims 7 & 8: Brown also disclose the conductively doping the undoped silicon after forming the rugged polysilicon and out diffusing impurity from the doped silicon into the undoped silicon (col.4, lines 3-40 and col. 7, lines 9-13 and 26-30).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Figura et al. invention by incorporating the doping undoped silicon and out diffusing impurity into the undoped silicon to reduce the growth of oxide and enhance conductivity of the layer in forming HSG.

Figura et al. also do not disclose the mass comprising forming an exposed undoped amorphous silicon for seeding and converting to HSG (cl.9), and doped polycrystalline silicon (cl.10)

Re. claims 9 & 10: Brown also disclose the mass comprising forming an exposed undoped amorphous silicon and doped polycrystalline silicon (col. 4, lines 3-40, col.6, lines 6-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Figura et al. invention by incorporating undoped amorphous silicon for seeding, annealing and converting to HSG.

Claims 13-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennision et al. (U.S. 5,340,765) .

Dennision et al. at figs. 1-8 and col. 1-8 disclose a method for forming enhanced capacitance stacked capacitor, which include:

-Re. claims 13, 17,20 & 21,: forming an insulative layer 16 over a doped region 11 on a semiconductor wafer substrate 10, an opening 21 through the insulative layer to

the doped region (cl. 2B), forming the silicon material within the opening that comprising doped silicon and undoped silicon and define a capacitor storage node (fig.3-7A), a portion of the undope silicon being in physical contact with the doped region (fig. 7B), removing a portion of the insulative layer 16 to expose a sidewall surface of the storage node, exposed sidewall comprising undoped silicon (figs. 7A, 7B), forming HSG from the undoped silicon of the exposed sidewall surface (col.4, lines 28-42), forming a cell plate proximate the storage node (col.4, lines 43-53).

-Re. claim 14,18 & 19: wherein the doped silicon comprising polysilicon and undoped silicon comprising amorphous silicon (cols.3 & 4, line 37-43).

-Re. claims 15 & 16 wherein the silicon material forming a layer of doped silicon between two layers of undoped amorphous silicon (cols.3 & 4, lines 37-6).

Claims 22 & 23: are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennision et al. (U.S. 5,340,765) and Kim et al. (U.S. 5,324,679).

Dennision et al. disclose substantially all of the claimed invention, except cleaning the sidewall by in situ HF in temperature at about 560^0 C.

-Re. Claims 22 & 23: Kim disclose the use of HF for cleaning a silicon surface in forming HSG structure at 800^0 C (col.4, lines 9-13, col. 8, cl. 11)

The temperature in forming the HSG is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller, 105 USPQ233, 255 (CCPA 1955) the selection of reaction parameters such as temperature and concentration would have been obvious.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dennision et al. invention by incorporating the cleaning by HF in situ, and a range of temperature to form a desired HSG structure.

Claims 58 & 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (U.S. 5,913,129) in view of Kim et al. (U.S. 5,324,679).

Wu et al. disclose substantially all of the claimed invention, except cleaning the sidewall by in situ HF in temperature at about 560^0 C.

-Re. Claims 58 & 59: Kim disclose the use of HF for cleaning a silicon surface in forming HSG structure at 800^0 C (col.4, lines 9-13, col. 8, cl. 11)

The temperature in forming the HSG is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller, 105 USPQ233, 255 (CCPA 1955) the selection of reaction parameters such as temperature and concentration would have been obvious.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Wu et al. invention by incorporating the HF cleaning to removed oxide and a range of temperature to form grain of the HSG structure.

Response to Arguments

Applicant's arguments with respect to claims 1-24 & 44-59 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu Huynh whose telephone number is (703)308-6110. The examiner can normally be reached on Monday-Friday from 8:00 AM to 4.30PM.

If attempts to reach the examiner by telephone are unsuccessfully, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (703) 308-4940. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-3432.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

YNBH,
6/24/03

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800